



PAGE 5/30 \* RCVD AT 10/5/2006 3:53:00 PM (Eastern Daylight Time) \* SVR:USPTO-EFXRF-2/15 \* DNIS:2738300 \* CSID:281 834 1231 \* DURATION (mm-ss):09-08



U. S. Application No. 10/717,865  
Attorney Docket No. 2003B005/2  
Reply to Final Rejection of September 14, 2006  
Response dated October 5, 2006

monomers, and having from 0.0 wt% to 2.0 wt% ethylene and a heat of fusion of 25 [J/g] or more, or 30 J/g or more, 50 J/g or more, or 70 J/g or more in some embodiments.

Please replace paragraph [0045] beginning on page 11, line 26 of the application as written with the following replacement paragraph:

Also described are processes of preparing a polymer composition that includes a diene-modified polypropylene random copolymer, which processes preferably include: contacting a metallocene catalyst compound having at least two indenyl rings or derivatives of indenyl rings, each ring being substituted at the 2 and/or 4 positions, with a polymerization medium that includes at least a propylene monomer and 2-methyl-1,5-hexadiene monomer or an  $\alpha$ , internal non-conjugated diene monomer that has an internal double bond comprising a di-substituted vinyl group or a tri-substituted vinyl group; and conducting polymerization of the monomers in the presence of the metallocene catalyst compound for a time sufficient to provide a diene-modified polypropylene random copolymer that includes monomeric units derived from each of the monomers, and having from 0.0 wt% to 2.0 wt% ethylene and a heat of fusion of 30 J/g or more, and a Branching Index of 1.0 or less, 0.95 or less, 0.90 or less or 0.80 or less.

Please replace paragraph [0049] beginning on page 12, line 18 of the application as written with the following replacement paragraph:

In one or more of the processes described herein the diene is 2-methyl-1,5-hexadiene or an[[, the]]  $\alpha$ , internal non-conjugated diene monomer, can include 2-methyl-1,5-hexadiene or such as 7-methyl-1,6-octadiene.

Please replace paragraph [0063] beginning on page 20, line 1 of the application as written with the following replacement paragraph:

In one or more embodiments described herein, the propylene copolymers have a Branching Index of 1.0 or less, or 0.98 or less, or ~~[[.95]]~~ 0.95 or less, or 0.90 or less, or 0.80 or less.

U. S. Application No. 10/717,865  
Attorney Docket No. 2003B005/2  
Reply to Final Rejection of September 14, 2006  
Response dated October 5, 2006

Please replace paragraph [0064] beginning on page 20, line 5 of the application as written with the following replacement paragraph:

As mentioned above, certain embodiments of this invention relate to a copolymer composition. In one or more specific embodiments, this invention is directed to a copolymer composition that includes crosslinkable diene-modified polypropylene random copolymer having propylene units; 2-methyl-1,5-hexadiene derived units or diene units derived from  $\alpha$ , internal non-conjugated diene monomers; from 0.0 wt% to  $[[20]]$  2.0 wt% ethylene units; and a heat of fusion of 25 J/g or more or 30 J/g or more.

Please replace paragraph [0065] beginning on page 20, line 11 of the application as written with the following replacement paragraph:

In one or more of the polymer compositions described herein, the diene units derived from 2-methyl-1,5-hexadiene monomers or  $\alpha$ , internal non-conjugated diene monomers are present in the polypropylene copolymer in an amount of from 0.0005 mol% to 10 mol% or, in another specific embodiment, from 0.005 mol% to 1 mol%.

Please replace paragraph [0066] beginning on page 20, line 15 of the application as written with the following replacement paragraph:

In one or more of the polymer compositions described herein, the diene monomer is 2-methyl-1,5-hexadiene or the  $\alpha$ , internal non-conjugated diene monomer is selected from the group consisting of 2-methyl-1,5-hexadiene and 7-methyl-1,6-octadiene 7-methyl-1,6-octadiene.

Please replace paragraph [0067] beginning on page 20, line 18 of the application as written with the following replacement paragraph:

In one or more of the polymer compositions described herein, the propylene copolymer has a crystallization temperature ( $T_c$ ) of 25 °C or more. Alternatively, the

U. S. Application No. 10/717,865  
Attorney Docket No. 2003B005/2  
Reply to Final Rejection of September 14, 2006  
Response dated October 5, 2006

polypropylene copolymer has a crystallization temperature (Tc) of 50 °C or more; or a crystallization temperature (Tc) of 75 °C or more; or a crystallization temperature (Tc) of 100 °C or more; or a crystallization temperature (Tc) of 125 °C or more; or a crystallization temperature (Tc) ranging from 25 °C to 115 °C.

Please replace paragraph [0070] beginning on page 21, line 4 of the application as written with the following replacement paragraph:

Embodiments of the invention include combining in a polymerization zone (a) propylene monomers; (b) 2-methyl-1,5-hexadiene monomers and/or one or more alpha, internal non-conjugated diene monomers (also referred to as  $\alpha$ , internal non-conjugated diene monomers or AIN dienes); and (c) a metallocene catalyst system under suitable polymerization conditions to produce a cross-linkable polypropylene random copolymer composition.

Please replace paragraph [0072] beginning on page 21, line 16 of the application as written with the following replacement paragraph:

The  $\alpha$ , internal diene monomers may be linear, cyclic, and/or multicyclic, including fused and non-fused cyclic dienes. Preferably, the  $\alpha$ , internal diene monomers are non-conjugated and linear. Also, preferably, the  $\alpha$ , internal diene monomers include  $\alpha$ , internal non-conjugated dienes in which the internal double bond is a vinylidene group or a tri-substituted unsaturation site. Examples of preferred  $\alpha$ , internal non-conjugated dienes include 2-methyl-1,5-hexadiene (which has a vinylidene group); 7-methyl-1,6-octadiene (which has a tri-substituted unsaturation site); dicyclopentadiene vinylnorbornene; ethylidene norbornene; 4-vinylcyclohexene; and 4-vinyl cyclopentene. Alternatively, 2-methyl-1,5-hexadiene (which has a vinylidene group) can be used.

Please replace paragraph [0076] beginning on page 22, line 10 of the application as written with the following replacement paragraph:



U. S. Application No. 10/717,865  
Attorney Docket No. 2003B005/2  
Reply to Final Rejection of September 14, 2006  
Response dated October 5, 2006

Please replace paragraph [00136] beginning on page 84, line 27 of the application as written with the following replacement paragraph:

Alternatively, the HPS may be operated over propylene's critical pressure but within the propylene/polypropylene two phase region. This is an economically preferred method if polypropylene is to be produced with a revamped high pressure polyethylene ("HPPE") plant. The recycled HPS overhead is cooled and dewaxed before being returned to the suction of the secondary compressor, which is typical of HPPE plant operation.

Please replace paragraph [00139] beginning on page 85, line 10 of the application as written with the following replacement paragraph:

Industrially a loop reactor is not operated at the high pressures encountered in autoclaves and tubes. One version of the [[PP]] polypropylene process operates in a supercritical region but below the cloud point curve of the polymer and at temperatures below the polymer crystallization point. Thus the polymer is present as a slurry with the temperature below the melting point of the polymer to avoid fouling deposition of polymer on the wall thereby reducing heat exchange.

Please replace paragraph [00144] beginning on page 86, line 4 of the application as written with the following replacement paragraph:

Propylene and higher olefins are far less susceptible to temperature runaway and explosive decomposition than ethylene, so potentially a higher maximum reactor operating temperature can be tolerated but within the limits of catalyst activity, molecular weight and ~~[[isotacticity]] isotacticity~~ requirements of the products.

Please replace paragraph [00153] beginning on page 87, line 30 of the application as written with the following replacement paragraph:



U. S. Application No. 10/717,865  
Attorney Docket No. 2003B005/2  
Reply to Final Rejection of September 14, 2006  
Response dated October 5, 2006

The low pressure separator ("LPS") running at just above atmospheric pressure is a sub critical flash of light components, reactants and oligomers thereof, for the purpose of producing a low volatile containing polymer melt entering the finishing extruder or static mixer.

Please replace paragraph [00166] beginning on page 91, line 24 of the application as written with the following replacement paragraph:

The films described herein may also comprise from 5 to 60 weight %, based upon the weight of the polymer and the resin, of the hydrocarbon resin. The resin may be combined with the polymer of the seal layer(s) or may be combined with the polymer in the core layer(s). The resin preferably has a softening point above 100\_°C[[.]], even more preferably from 130\_°C to 180\_°C. Preferred hydrocarbon resins include those described above. The films comprising a hydrocarbon resin may be oriented in uniaxial or biaxial directions to the same or different degrees.

Please replace paragraph [00186] beginning on page 99, line 2 of the application as written with the following replacement paragraph:

In this example, a number of copolymers were synthesized using specific metallocene catalysts via batch bulk propylene slurry processes. The comonomers used in the polymerization were: 7-methyl-1,6-octadiene (MOD); 2-methyl-1,5-hexadiene (MHD);. The specific catalysts used were supported dimethylsilylbis(2-methyl-4-phenyl indenyl)zirconium dichloride and supported dimethylsilylbis (2-methylindenyl)zirconium dichloride/MAO. Individual batch copolymerization runs were conducted using one of the above comonomers and catalysts @ 60 – 70[<sup>0</sup>] °C for 30 - 60 minutes under hydrogen (0 - 6 psi). The products were washed twice with hexane to remove the residual comonomer and were characterized by <sup>1</sup>H NMR, DSC, MI, and GPC-3D techniques. The copolymerization conditions and results are included in Tables 4-10.

**Please amend the Abstract as follows:**

PAGE 13/30 \* RCVD AT 10/5/2006 3:53:00 PM [Eastern Daylight Time] \* SVR:USPTO-EFXRF-2/15 \* DNIS:2738300 \* CSID:281 834 1231 \* DURATION (mm-ss):09-08